—On the normal spectrum of the sun, the ultra-violet part, by M. A. Cornu, with a plate.

Nachrichten von der Königl. Gesellschaft der Wissenschaften und der G. A. Universität zu Göttingen (Nos. 11–16, 1875).—From these publications we note the following papers:—Researches on the magnetism of steel rods, by Dr. Carl Fromme.—On the oscillations of a magnet under the resisting influence of a copper ball, by Franz Himstert.—On the determination of the specific conducting resistance of gas coal, by Ed. Riecke.—On hyperelliptical integrals, by L. Koenigsberger.—On the irregularities and fundamental numbers of plane curves of the third order with points, by Dr. Hermann Schubert.—On the symmetric functions of weight (XI.), by Prof. Faa de Bruno.—On the volcanic ashes of Turrialba (Costa Rica), by Heinr. O. Lang.—On the structure of German ferns, by H. Conwentz.

Göttingen Royal Society of Sciences.—Nos. 1 to 10 of this society's *Nachrichten* contain the following among other papers: On some cut stones (flints) hitherto unknown, by Fr. Wieseler.—On elastic after effects, by Fr. Kohlrausch.—On Asa Grey's group of *Diapensiaceæ*, by Dr. O. Drude.—On a new genus of Palmæ of the Arecineæ group, called *Grisebachia*, by the same and H. Wendland.—On the proof of Cauchy's theorem for complex functions, by G. Mittag-Leffler.—On the curvature of some planes, by A. Enneper.—On Rabuteau's law of the toxical effect of elements and the action of lithium, by Prof. Husemann.—On a fundamental theme of Plücker's geometry, by Dr. A. Voss.—On the ends of sensitive nerves in the skin, by Prof. F. Merkel.—On dibromobenzoic acids, by A. Burghard.—On iodosulphotoluol, by H. Glassner.—On mononitrobenzonaphtylamides, dinitrobenzonaphtylamide and their derivatives, by P. Ebell.—On *Fucus vesiculosus*, by J. Reinke.—On the action of a weak acid upon the salt of a stronger acid, by H. Hübner and H. Wiesinger.—On magnetism in steel rods, by Herr Fromme.—On the specific resistance of gas-coal, by Herr Schrader.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 23.—Mr. John Evans, V.P.R.S., president, in the chair.—Some observations on the Rev. O. Fisher's remarks on Mr. Mallet's theory of volcanic energy, read May 12, 1875, by Robert Mallet, F.R.S. The subject of the Rev. O. Fisher's paper has been anticipated by one from Prof. Hilgard (Geol. Univ. of Michigan) published in the *American Journal of Science* (vol. vii., June 1874). The pith of the Rev. O. Fisher's communication is to a great extent comprised in the two following sentences:—1. That "if crushing the rocks can induce fusion, then the cubes experimented upon ought to have been fused in the crushing?" 2. "If the work (of crushing) is equally distributed throughout, why should not the heat be so also? or if not, what determines the localisation?" In his reply Mr. Mallet controverts the views of the Rev. O. Fisher by bringing them into contact with acknowledged physical laws. He shows that "crushing alone of rocky masses beneath our earth's crust may be sufficient to produce fusion. He also shows that the heat developed by crushing alone cannot be equally diffused throughout the mass crushed, but must be localised, and that the circumstances of this localisation must result in producing a local temperature far greater than that due to crushing. Lastly, he shows that after the highest temperatures have been thus reached, a still further and great exaltation of temperature must arise from detrusive friction and the movements of forcible deformation of the already crushed and heated material." He therefore expresses his conviction that "there is no physical difficulty in the conception involved in his original memoir (Phil. Trans. 1873), but not there enlarged upon in detail, that the temperatures consequent upon crushing the materials of our earth's crust are sufficient locally to bring these into fusion."

On the physical conditions under which the Cambrian and Lower Silurian rocks were probably deposited over the European area, by Mr. Henry Hicks. The author indicates that the base line of the Cambrian rocks is seen everywhere in Europe to rest unconformably upon rocks supposed to be of the age of the Laurentian of Canada, and that the existence of these Pre-Cambrian rocks indicates that large continental areas existed previous to the deposition of the Cambrian rocks. The central line of the Pre-Cambrian European continent would be shown by a line drawn from S.W. to N.E. along the south coast of the English Channel, and continued through Holland and Denmark to the Baltic. Its boundaries were mountainous; they are indicated in the north by the Pre-Cambrian ridges in Pembrokeshire, in the Hebrides and Western Highlands, and by the gneissic rocks of Norway, Sweden, and Lapland. The southern line commenced to the south of Spain, passing along Southern Europe, and terminated probably in some elevated plains in Russia. Between these chains the land formed an undulating plain, sloping gradually to the south-west, its boundary in this direction being probably a line drawn from Spain to a point beyond the British Isles, now marked by the 100-fathom line. The land here facing the Atlantic Ocean would be lowest, and would be first submerged when the slow and regular depression of the Pre-Cambrian land took place. The author points out that the evidence furnished by the Cambrian and Lower Silurian deposits of Europe is in accordance with this hypothesis. In England they attain a thickness of 25,000 to 30,000 feet; in Sweden not more than 1,000 feet; and in Russia they are still thinner, and the earlier deposits seem to be wanting. In Bohemia they occupy an intermediate position as to thickness and order of deposition. The author discusses the phenomena presented by the Welsh deposits of Cambrian and Lower Silurian age, and shows that we have first conglomerates composed of pebbles of the Pre-Cambrian rocks, indicating beach conditions, then ripple-marked sandstones and shallow-water accumulations, and then, after the rather sudden occurrence of a greater depression, finer deposits containing the earliest organisms of this region, which he believes to have immigrated from the deep water of the ocean lying to the south-west. After this the depression was very gradual for a long period, and the deposits were generally formed in shallow water; then came a greater depression, marked by finer beds containing the second fauna; then a period of gradual subsidence, followed by a more decided depression of probably 1,000 feet, the deposits formed in this containing the third or "Menevian" fauna. This depression enabled the water to spread over the area between the south of Prussia and Bohemia and Norway and Sweden, there being no evidence of the presence of the first and second faunas over this area. The filling up of this depression led to the deposition of the shallow-water deposits of the Lingula-Flag group, followed by another sudden depression at the commencement of the Tremadoc epoch, which allowed the water to spread freely over the whole European area. The author next discusses the faunas of the successive epochs, and indicates that these are also in favour of his views. He indicates the probability that the animals, which are all of marine forms, migrated into the European area from some point to the south-west, probably near the equator, where he supposes the earliest types were developed. Both the lower and higher types of invertebrates appear first in the western areas; and the groups in each case as they first appear are those which biologists now recognise as being most nearly allied, and which may have developed from one common type. The lower invertebrates appear at a very much earlier period than the higher in all the areas. In the Welsh area the higher forms (the Gasteropods, Lamellibranchs, and Cephalopods) come in for the first time in Lower Tremadoc rocks; and with the exception of the presence of a Gasteropod in rather lower beds in Spain, this is the earliest evidence of these higher forms having reached the European area. At this time, however, no less than five distinct faunas of lower invertebrates had already appeared; and an enormous period, indicated by the deposition of nearly 15,000 feet of deposits, had elapsed since the first fauna had reached this area. The author points out also that a similar encroachment of the sea and migration of animals in a north-westerly direction occurred in the North American area at about the same time, the lines indicating the European and American depressions meeting in Mid-Atlantic.

On a Bone-cave in Creswell Crags, by the Rev. J. Magens Mello. In this paper the author describes some fissures containing numerous bones, situated in Creswell Crags, a ravine bounded by cliffs of Lower Permian limestone on the north-eastern borders of Derbyshire. These cliffs contain numerous fissures. The principal one described by the author penetrates about fifty yards into the rock, and has a wide opening, but is very narrow throughout the greater part of its length. It runs nearly north and south, and inclines slightly from west to east from the top downwards. The organic remains found in the first fissure belong to fourteen mammals at least, besides a bird and a fish. The mammalia are: Man, *Lepus timidus*, *Gulo luscus*, *Hyæna spelæa*, *Ursus*, sp., *Canis lupus*, *Canis vulpes*, *Canis lagopus*, *Elephas primigenius*, *Equus caballus*, *Rhinoceros ticho-*

rhinus, Bos urus, Cervus megaceros, Cervus tarandus, Ovis, sp., *Arvicola*, sp.

Notes on Haytor Iron Mine, by Clement Le Neve Foster, D.Sc.

On the formation of the Polar Ice-cap, by Mr. J. J. Murphy. The present paper is intended by the author to supplement a previous one read before the Society in 1869 (Q. J. G. S., vol. xxv. p. 350), in which he gave reasons for differing from Mr. Croll in thinking that the glacial climate was one of intense cold, and held, on the contrary, that it was one of snowy winters and cold summers, with a small range of temperature. Mr. Campbell, in a paper read before the Society in 1874, gave the following as the southernmost limits of the polar ice-cap, viz. :—In Eastern Europe, lat. 56° N. ; in Germany, 55° ; in Britain, nearly 50° ; in America, 39°. This the author considers as strong but not new evidence against the theory of ice-cap extending to low latitudes ; the extent of the ice-cap would of course not be so wide as that of the limits of glaciation, owing to the floating ice approaching nearer the equator. After commenting on Mr. Belt's remarks made during the discussion of Mr. Campbell's paper, the author states that he attributes the presence of the boulders found in the valley of the Amazon to icebergs which had drifted further than usual. The glaciation of the tropics would imply the glaciation of the whole world, which appears no more possible than that the whole world was submerged at one time. The author concludes with some remarks on a recent paper of Mr. Tylor's.

Notes on the Gasteropoda of the Guelph Formation of Canada, by Prof. H. Alleyne Nicholson, D.Sc., F.R.S.E. The author notices the occurrence of the Guelph formation as a subdivision of the Niagara series in Canada and the United States, and describes it as consisting everywhere of a cellular, yellowish, or cream-coloured dolomitic limestone of rough texture and crystalline aspect, containing innumerable cavities from which fossils of various kinds have been dissolved out. In this paper the author describes all the known Gasteropoda of the Guelph formation in Canada, including the following previously described species :—*Murchisonia Loganii* (Hall), *M. turritiformis* (Hall), *M. macrospira* (Hall), *M. bivittata* (Hall), *M. longispira* (Hall), *M. vitellia* (Billings), *M. Hercyna* (Billings), *Cyclonema ? elevata* (Hall), *Holopea guelphensis* (Billings), *H. gracia* (Billings), *Subulites ventricosus* (Hall), and *Pleurotomaria solarioides* (Hall). As new species he describes *Murchisonia Boylei*, distinguished from *M. turritiformis* (Hall) and *M. estella* (Billings) by its more rapid rate of expansion, its apparently canaliculated suture, and the existence of an angular band a little above the suture ; and *Holopea ? occidentalis*, distinguished by its short but elevated spire, its large body-whorl, which becomes almost disjunct at the aperture, its circular aperture, and large umbilicus. The upper whorls are convex, but the body-whorl is obtusely angulated at about its upper fourth. Uncertain species of *Murchisonia* and *Pleurotomaria* are also indicated.

Description of a new genus of Tabulate Coral, by Mr. G. J. Hinde. The coral described by the author as constituting a new genus of Favositidæ, for which he proposes the name of *Sphærolites*, has a massive free corallum consisting of minute, polygonal, closely united corallites, growing in all directions from a central point, forming a spheroidal body, the entire surface of which is occupied by the calices of the corallites. The walls of the corallites are very delicate, with numerous pores ; the tabulæ are incomplete, formed by delicate arched lamellæ, and there are no septa. From *Chætetes* this genus is distinguished by the perforated walls and incomplete arched tabulæ ; from *Favosites* it differs in its mode of growth and its incomplete tabulæ ; and from *Michelinia* it is separated by the minuteness of its corallites, and the absence of epitheca and of septal striæ. The single species, which is named *S. Nicholsoni*, is from calcareous shale of Lower Helderberg (Ludlow) age, near Dalhousie, in New Brunswick.—(*To be continued.*)

Physical Society, June 26 (continued from p. 179).—Prof. G. C. Foster, vice-president, in the chair.—Prof. G. C. Foster called attention to the work of Prof. Everett on the Centimetre-gramme-second (C.G.S.) System of Units which will shortly be published by the Society. It is designed to facilitate the study of the quantitative relations between the different departments of physical science by the adoption of a common system of units. Prof. Foster explained that a committee of the British Association which was appointed in 1872, and of which Prof. Everett was secretary, recommended the adoption of this system, based upon the metric system, the unit of *mass* being the gramme, that of *length* the centimetre, and that of *time* the second. They recommended that the unit of force be called a *dyne*, which therefore is the force required to act upon a gramme of matter for a second to generate a velocity of a centimetre per second. The unit of work is called an *erg*, and is the amount of work done by a dyne working through the distance of a centimetre. Prof. Everett's book consists of a collection of physical data reduced to these fundamental terms, so that no other physical magnitudes enter into the expressions, and it cannot fail to prove of the greatest possible value to physicists. Prof. Foster then left the chair, which was taken by Dr. Stone.—Dr. W. .M Watts communicated a paper on a new form of micrometer for use in spectroscopic analysis. In determining the positions of lines in a spectrum by the use of a micrometer eye-piece or divided arc, it is often difficult to see the cross wires distinctly without admitting extraneous light, which with faint spectra frequently cannot be done. Dr. Watts has sought to overcome this difficulty by substituting some one known line of the spectrum itself for the cross wires, and to measure the positions of unknown lines by bringing this index line successively into coincidence with them. Thus, for example, the sodium line, which is present in nearly every spectrum whether it is wanted or not, may be made to move slowly when under the spectrum, and the displacement necessary to make it coincide with the lines to be measured may be determined by the readings of a micrometer screw. To accomplish this a convex lens of about two-feet focus is placed in front of the prism of the spectroscope, between the prism and observing telescope, and is divided along a line at right-angles to the refracting edge of the prism. One half of the lens is fixed, the other half is made to slide over it by means of a micrometer screw. When the movable half of the lens is in its normal position, the only effect is to alter the focus of the telescope slightly, but when it is made to slide over the fixed half, the refraction of the prism is increased or diminished, and half of the spectrum appears to move over the other half, and the sodium line, or any other convenient line of reference can be brought into coincidence with the lines to be measured. The indications of this instrument are reduced to wave-lengths by means of a series of interpolation curves from the data obtained by observations of the solar spectrum, the co-ordinates of which are wave-lengths and micrometer readings. The author considers the advantages of the instrument to be (1) great precision in results ; and (2) convenience in use. In illustration of the former quality he quotes twenty readings of the point at which there is coincidence of the lenses. They are remarkably concordant, the mean being 8·34, while the two extreme readings are 8·21 and 8·41.—Prof. Guthrie then read a paper on the fundamental water-waves in cylindrical vessels. He stated that many attempts had been made to connect wave-lengths with wave-amplitude, and that the most successful of these were by the brothers Weber, who allowed a column of water to fall into one end of a long trough filled with water ; and they ascertained by means of a stop-watch when the crest of the wave reached the other end. Dr. Guthrie has recently made some experiments on this subject, in which he employed a series of five vessels, varying in diameter from 5·5 to 23·5 inches. The water in each was agitated in the centre by a disc of wood, by which means the vessel was made to give what Dr. Guthrie called its "fundamental note." He counted the number of times the wave rose in the centre in a minute, and he found that amplitude has no influence upon the rate. It should also be observed that the wave effect is not the same as if the field were of infinite extent. The following are the results he obtained :—

	Diameter of vessel.	No. of pulsations per minute.
(1)	23·5 inches.	106·5
(2)	17·87 ,,	122·7
(3)	14·5 ,,	136·0
(4)	12·5 ,,	146·5
(5)	5·5 ,,	219·0

From which he deduced the curious result that a constant quantity (517·5) is obtained by multiplying the square root of the diameter by the number of pulsations. The question of depth was also carefully considered, and it was ascertained that the number of waves increases slightly with the depth.—Mr. S. C. Tisley read a paper on a new form of magneto-electric machine. After briefly describing the machines which have

hitherto been devised, he stated that the new apparatus consists essentially of an electro-magnet with shoes forming a groove, in which a Siemens' armature is made to revolve. It differs from the original machines made by Siemens and Wheatstone in the commutator, as two springs conduct the current from the cylindrical insulator, to which are attached three pieces of metal, one surrounding it for three-quarters of its circumference, the second for one quarter, and between these is a ring connected with the insulated end of the wire from the armature, and bearing two pieces of metal which are so arranged as to complete the circles of the outer pieces of metal. The armature is so constructed that a stream of water may be constantly passed through it. A small machine constructed on this principle, which without its driving gear weighs 26 lbs., is capable of raising 8 inches of platinum wire 8 inches long and ·005 inches in diameter to a red heat.—Dr. Stone then adjourned the meetings of the Society until November.

VIENNA

Imperial Academy of Sciences, Jan. 14.—The following papers were read:—On the temperatures arising from the mixing of sulphuric acid with water, with reference to the molecular heats and boiling points of the resulting hydrates, by Dr. L. Pfaundler.—On the occurrence of relatively high temperatures of air in the valleys of the Alps, by Prof. Kerner.—On some researches on dinitro compounds of the phenyl series, by Prof. Hlasiwetz. The author shows that phenol can easily be converted into dinitrophenol if treated with nitrous acid when dissolved in ether. At the same time mononitrophenol is formed—

(1) $C_6H_5.OH + N_2O_3 = C_6H_4N_2O + N_2O_5 + H_2O$
(2) $2C_6H_5.OH + N_2O_5 = 2C_6H_4.NO_2.OH + H_2O$.

—Prof. Weiss then gave an account of his observations of the transit of Venus at Jassy. The inner contact could not be observed through clouds, but the outer one was observed at 20h. 25m. 49s·7 Jassy mean time. Prof. Weiss thinks that through the unsatisfactory state of the atmosphere this result may probably not be quite correct, and that the actual contact took place a few tenths of a second later. The longitude of the observing station was found to be 44m. 49s.·7 east of the Imperial Observatory of Vienna (probable error in this = ± 0s·1).—Prof. Oppolzer gave an account of his observations at the same place, and quoted his results in Paris mean time. In the reports of the Academy for April 1870 he had given the time for the second outer contact 18h. 45m. 25s.·7 Paris mean time; he found by observation 18h. 44m. 56s.·3 Paris mean time; difference, 29s.·4. The latitude of Jassy is given as + 47° 9′ 25″·1 (± 0″·2).

Jan. 21.—The following papers were read:—A note on the experimental determination of diamagnetism by means of its electric action of induction, by Prof. Toepler.—On the action of the muscular current upon a secondary circle of currents, and on a peculiarity of currents of induction, induced by a very weak primary current; by Prof. Brücke.—On some *Acara* and *Geophagus* species of the Amazon River, by Dr. Steindachner; in a second paper this gentleman spoke of four new Brazilian siluroids, belonging to *Oxydoras*, *Doras*, and *Rhinodoras*.

Feb. 4.—On the double refraction of quartz under pressure, by Prof. Mach.—On the latent heat of vapours, by Prof. Puschl.—On the fine structure of bones, by Prof. v. Ebner.—Detailed classification of all known Foraminifera, by A. v. Reuss.—Researches on the development of Naiades (freshwater mussels), by W. Flemming.—On the dependence of the coefficient of friction of the air upon temperature, by A. v. Obermayer.

Feb. 18.—On phenomena of flexion in the spectrum, by W. Rosicky.—On the temperatures of solidification of the hydrates of sulphuric acid and the composition of the crystals formed, by Prof. Pfaundler and E. Schnegg.

Feb. 25.—On the Tertiary strata on the north side of the Apennines from Ancona to Bologna, and on the Pliocene formations of Syracuse and Lentini, by Th. Fuchs and A. Bittner.

March 11.—On the great ice period, and on some geological theories, by Dr. A. Boué.—On anthracene and its behaviour towards iodine and mercuric oxide, by Dr. H. Hlasiwetz and Dr. O. Zeidler.

March 18.—On a consequence drawn from Biot-Savart's law, by Prof. A. Wassmuth.—On the thermoelectric behaviour of metals during melting and solidification, by A. v. Obermayer.

STOCKHOLM

Kongl. Vetenskaps Akademiens Förhandlingar, Jan. 13.—The following papers were read:—On the relation of temperature and moisture in the lowest strata of the atmosphere at daybreak, by R. Rubenson.—On the efflorescence of alum salts and their influence on vegetation, by C. E. Bergstrand.—On the conduction of heat in a cylinder, by G. Lundquist.—On the situation of moraines and terraces on the banks of many inland lakes, by A. Helland (with plate).—*Insecta Transvaalensia*, a contribution to the insect fauna of the Transvaal Republic, South Africa, by H. D. J. Wallengren.—On the low vegetation of Omberg, by P. G. E. Theorin. These papers are all in Swedish, with the exception of that by A. Helland, which is in the Danish language.

PARIS

Academy of Sciences, July 5.—M. Frémy in the chair.—The following papers were read:—A note by M. Chevreul, on the explanation of numerous phenomena which are a consequence of old age. This is the abstract of a third memoir on the subject.—On the distribution of magnetism in bundles of an infinite length composed of very thin laminæ, by M. J. Jamin.—Second note on tabular electro-magnets with multiple cores, by M. T. du Moncel.—The rain of Montpelier during twenty-three years (1852–74), from observations at the Jardin des Plantes, by M. Ch. Martins.—On the Devonian period in the Pyrenees, by M. A. Leymerie.—A letter was read from P. Secchi, accompanying the presentation of the second French edition of his work on the Sun.—Description of the group of the Pleiades and micrometric measurements of the positions of the principal stars which compose it, by M. Wolf. The author employed an object-glass of 0·31m. aperture, the positions being given to one-tenth of a minute of arc. The catalogue comprises 499 stars from the 3rd to the 14th magnitude, contained in a rectangle 135 min. long, and 90 min. broad, η Tauri occupying the centre. All the stars in the group are referable to P. Secchi's first type with regard to their spectra. The differences between the author's measurements and those of Bessel seem to point to the conclusion that the group has a proper motion towards the north-west.—Researches on carbon monosulphide, by M. Sidot. According to the author, this substance is formed by the prolonged action of light on carbon disulphide. It is described as a reddish brown powder possessing neither taste nor smell. Analyses gave numbers agreeing with the required formula CS.—On atmospheric currents, by M. J. A. Broun.—Phylloxera in the Department of Gironde, by M. Azam.—Planet 146 Lucine. Elements of the orbit calculated, by M. E. Stéphan.—On the processes of magnetisation, by M. J. M. Gaugain.—The nut from Bancoul. Chemical studies of the oleaginous fruits of tropical countries, by M. B. Corenwinder.—On the gum in wine and its influence on the determination of the glucose, by M. G. Chancel.—Chlorobrominated ethylene: isomerism of its chloride and the bromide of perchlorinated ethylene, by M. E. Bourgoin.—Influence of chalk on the distribution of the so-called "calcifuge" plants, by M. C. Contejean.—On the absorption of coloured liquids, by M. Cauvet.

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